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ABSTRACT

This report provides results of Phase I of a project that researched the occupational area of environmental horticulture, established appropriate committees, and conducted task verification. These results are intended to guide development of a program designed to address the needs of the horticulture field. Section 1 contains general information: purpose of Phase I; description of the occupation, including nature of work, working conditions, and related occupations; direction of the occupation, including employment, training and other qualifications, advancement, job outlook, and earnings; program development committee; areas of concern; and State Technical Committee developmental recommendations. Section 2 presents research findings: accreditation and certification; appropriate trade resources and sources, including references and textbooks, professional organizations, and sources of additional information; and typical job titles. An occupational duty and task list is comprised of seven duties: performing administrative functions, preparing soil and growing media, propagating horticultural plants, growing plants, performing equipment/structure maintenance operations, harvesting plants, and performing sales. Other contents include a tools and equipment list and staff and facilities recommendations. (YLB)

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ENVIRONMENTAL HORTICULTURE

PHASE I

PROJECT REPORT

WITH

RESEARCH FINDINGS

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ENVIRONMENTAL HORTICULTURE CONTRACT

PROJECT REPORT

PHASE I

WITH

RESEARCH FINDINGS

Developed by

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Division of Vocational Education
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SECTION ONE
GENERAL INFORMATION

Purpose of Phase I

Phase I focused on researching the occupation, establishing appropriate committees, and conducting task verification. The results of this phase have provided the basic information required to develop the program standards and guide and set up the committee structure to guide the project.

The environmental horticulture program is designed to address the needs of the horticulture industry. The program also provides the foundation which will enable graduates to become self-employed.

Description of Occupation

Nature of the Work

Attractively designed, healthy, and well-maintained lawns, gardens, trees, and shrubbery can help create a positive first impression, establish a peaceful mood, and increase property values. A growing number of individuals and organizations rely on horticulture workers to do this work for them.

Workers may plant and care for trees, plants, and lawns, but their duties vary noticeably by specialty, with some jobs encompassing a much wider array of responsibilities than others. A large commercial project, for example, might entail landscaping the interior and exterior of a new shopping mall. Following the plans drawn up by the landscape architect, workers plant trees, hedges, and flowering plants and apply mulch for protection. For a residential customer, the job might be more involved. In order to create a more desirable backyard environment, for example, a worker might terrace a hillside, build retaining walls, and install a patio, as well as plant trees and shrubs. They may also care for the landscape after it is completed.

Horticulturists working exclusively for homeowners, estates, and public gardens are responsible for the overall care of the property, ranging from feeding, watering, and pruning the flowering plants and trees to mowing and watering the lawn. Some employees, called lawn service workers, specialize in maintaining lawns and shrubs for a fee. A growing number of residential and commercial clients, such as managers of office buildings, shopping malls, multiunit residential buildings, hotels, and motels, favor this full-service landscape maintenance. These workers perform a full range of duties, including mowing, edging, trimming, fertilizing, dethatching, and mulching. Technicians working for chemical lawn service firms routinely inspect lawns for problems and apply fertilizers, weed killers, and other chemicals to lawns.

Some workers have even more varied duties than do others, frequently combining the work of a gardener with that of a maintenance mechanic. They may work on athletic fields, golf courses, cemeteries, or parks.

Those who care for athletic fields are responsible for keeping playing surfaces--both natural and artificial--in top condition as well as marking the boundaries and painting team logos and names on the playing fields before each athletic event. In order to keep natural turf fields in good playing condition, they must make sure the underlying soil has the proper consistency to sustain new sod. They generally resod the entire field once a year in order to provide the best possible footing for the athletes. Their duties regularly include mowing, watering, fertilizing, and aerating the fields. They must control insects with chemicals and apply fungicides to prevent diseases. Weeds and crabgrass must also be removed.

Synthetic turf requires special care, although it doesn't have to be mowed, watered, or fertilized. The field must be vacuumed and disinfected after use in order to prevent growth of harmful bacteria. Also, the turf must be removed and the cushioning pad replaced periodically.

Groundskeepers maintain golf courses. They have to do many of the same things athletic field groundskeepers do. In order to keep the putting greens in good condition, groundskeepers periodically relocate the hole, usually after 250 or more rounds of golf. Changing the pin placement eliminates uneven wear of the turf and adds interest and challenge to the game. The groundskeeper must also keep canopies, benches, ball washers, and tee markers repaired and freshly painted, as well as perform other tasks in order to keep the course neat and attractive at all times.

By far the most varied job duties belong to groundskeepers who are responsible for parks and recreation facilities. Their responsibilities encompass just about everything necessary to keep these facilities ready for the many people who use them. Basic duties include caring for lawns, trees, and shrubs; maintaining athletic fields and playgrounds; and keeping parking lots, picnic areas, and other public spaces free of litter. Depending on the type and location of the facility, their duties also may include removing snow and ice from roads and walkways, erecting and dismantling snow fences, and maintaining swimming pools. These workers regularly inspect and clean all buildings, make needed repairs, and keep everything freshly painted. They inspect playground equipment and keep it in safe working condition.

Many different kinds of equipment and tools are used in landscaping and grounds maintenance. Although more and more gardeners and groundskeepers are using power tools to make their jobs easier, they still use hand tools when working confined spaces where large or automated equipment is difficult and dangerous to use. The most commonly used handtools include pruning saws, regular handsaws, hedge and brush trimmers, and axes. Many workers use power lawnmowers, chainsaws, snowblowers, and electric clippers. Some workers who care for estates, commercial and industrial grounds, and golf courses use large mechanized equipment, such as tractors and twin-axle vehicles. Cemetery workers often use tractor-pulled flail mowers that enable safe mowing over grave markers. Park, school, cemetery, and golf course groundskeepers may use sod cutters to harvest sod that will be replanted elsewhere. Athletic turf groundskeepers use magnetic sweepers and vacuums and other devices to remove water from in large operations use spraying and dusting equipment.

Working Conditions

Horticulturist workers work outdoors in all kinds of weather. They are frequently under pressure to get the job completed, especially when they are preparing for public events, such as athletic competitions or burials.

They are exposed to dangerous pesticides, insecticides, and other chemicals and must exercise safety precautions to prevent risk. They are also exposed to dangerous equipment and tools, such as power lawnmowers, chainsaws, and electric clippers.

Direction of the Occupation

Employment

In 1986, horticulture workers held approximately one million jobs. About three every 10 worked for lawn and garden services, cemeteries, and landscape architects. About 2 of every 10 worked for private households and estates, and 1 in 10 worked for parks and recreational facilities. Others were employed by retail nurseries and garden stores or large institutions, including hospitals, schools, and hotels. Approximately 2 out of 10 were self-employed.

About 1 out of 3 work part time. Most of these are students working their way through school. Others working part time are older workers who may be cutting back their hours as they approach retirement.

Training, Other Qualifications and Advancement

Entrance requirements are modest. Generally, a high school education or its equivalent, or related experience is sufficient. Some people gain experience as a home gardener or by working in a nursery, a sod production operation, or for a tree service. Most entrants are recent high school graduates.

There are no national standards for horticulture workers, but some states require certification for workers who use chemicals extensively, such as some workers employed by chemical lawn services. Certification requirements vary, but usually include passing a test on the proper and safe use of insecticides, pesticides, herbicides, and fungicides.

Employers prefer applicants with a good driving record and some experience driving a truck, especially those with lawn services, must transport equipment to and from job sites. Workers often deal directly with customers, so they must get along well with people. Employers also look for responsible, self-motivated individuals, because many gardeners and groundskeepers work with little supervision.

Generally, a horticultural worker can advance to supervisor after several years of progressively responsible experience, including the demonstrated ability to deal effectively with both coworkers and customers. Courses taken in agronomy, horticulture, and botany are helpful for advancement.

Supervisors can advance to manager with further experience combined with appropriate education. Many managers have completed postsecondary training in fields such as agronomy, horticulture, or botany, and some earn bachelor's degrees in these disciplines.

The Professional Grounds Management Society offers in-house certification to those managers who have a combination of 8 years' experience and formal education beyond high school.

Other workers whose jobs may be performed outdoors are construction workers, gardeners, groundskeepers, nursery workers, farmers, greenhouse workers, landscape workers, tree surgeon helpers, tree trimmers and pruners, and forest conservation workers.

Job Outlook

Employment is expected to increase faster than the average for all occupations through the year 2000 in response to increasing demand for gardening and landscaping services. Despite this growth, most job openings are expected to result from the need to replace workers who transfer to other occupations, retire, or leave the labor force. The level of new construction is a major determinant of the demand for workers. The expected growth in the construction of commercial and industrial buildings, shopping malls, homes, highways, cemeteries, parks, athletic fields, golf courses, and similar recreational facilities should stimulate demand for these workers. Developers are increasingly using landscaping services, both interior and exterior, to attract prospective buyers and tenants. In addition, a growing number of homeowners are using lawn maintenance and landscaping services to enhance the beauty and value of their property as well as to conserve their leisure time.

Job openings should be plentiful because the occupation is large and turnover is high. This occupation attracts many young people who do not seek careers. Some may take a job to earn money for a specific purpose, such as financing a college education; others may only take a job until a better paying one is found. Because wages for beginners are low and the work is physically demanding, many employers have difficulty attracting enough workers to fill available openings.

Earnings

Median hourly earnings were \$5.70 in 1987; the middle 50 percent earned between \$4.65 and \$8.20. The lowest 10 percent earned less than \$3.65, and the top 10 percent earned more than \$10.95 an hour.

According to a survey conducted by Lawn Care Industry Magazine, the average salary for those who worked for chemical lawn care firms was \$7 an hour in 1987. Those who worked for landscape maintenance firms earned an average of \$7.50 an hour.

The information presented in **Description of the Occupation and Direction of the Occupation** is adapted from public domain material, originally published in the *Occupational Outlook Handbook*, Bulletin 2300, by the Bureau of Labor Statistics, U.S. Department of Labor, Washington, D.C. 20212.

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State Technical Committee Areas of Concern

- a. Employees are needed with desirable career characteristics to include: being a dependable self starter; having good math and communication skills; possessing good work ethic hands on experience; and enjoy physical work.
- b. Interpersonal skills are essential as well as being able to deal with "hi-tech" developments. Employees must demonstrate a willingness to continue to learn and keep up to date and have an innate love for nature and growing things.
- c. The program must include provisions for instruction in future developments such as: water availability/use/control, automation-robots, new plant technology, new equipment, new chemicals, and environmental protection laws.

State Technical Committee Developmental Recommendations

1. Change name of program to Environmental horticulture.
2. Program length should be 1 year/4 quarters with 1 quarter internship a possibility in 4th quarter.
3. Areas of employment for graduate include: floriculture, garden centers, interior landscape - design - install - maintain, exterior landscape - design - install - maintain, turf management, arboriculture, greenhouse, and nursery.
4. The employment outlook for graduate were identified for three general areas: nursery - slight increase, greenhouse - moderate increase, and landscape - large increase.
5. Students should be provided education in the following areas of environmental horticulture: science of horticulture, environmental considerations (EPA), design factors/drawing skills, soil preparation, plant propagation, installing/planning, maintaining/growing (climate control-water chemicals), insect and disease control (spraying), harvesting/packaging, scheduling/planning, equipment use and maintenance, business management (records, computers, sales, procurement, transport, and safety considerations (OSHA).
6. Students should be prepared to qualify for State pesticide licensure and made aware of the following related professional organizations: Georgia Nurseryman's Association (GNA), Georgia Pesticide application licensure, Georgia Association of Landscape Professional (GALP), and Georgia Certified Nurseryman.

SECTION TWO
RESEARCH FINDINGS

Accreditation and Certification

There are no national or state requirements for program accreditation or certification established. There are no individual certification or licensure requirements which job applicants must meet prior to entry into occupations in the environmental horticulture field.

The environmental horticulture program must conform to the institutional accreditation requirements of the Southern Association of Colleges and Schools by meeting Commission on colleges (COC) or Commission on Occupational Education Institutions (COEI) accreditation requirements and must not conflict with the accreditation criteria established by COC or COEI.

Appropriate Trade Resources

References and Textbooks

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Kyte, L. (1983). Plants from test tubes an introduction to micropropagation. Portland: Timber Press.

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Nuseries. Affiliated with the North Dakota Department of Agriculture.

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Pirone, P. (latest ed.). Tree maintenance. (5th ed.). New York: Oxford University Press.

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Wetherell, D. (1982). Introduction to in vitro propagation. Wayne, NJ: Avery.

Yound, Eric (Ed.). Horticulture news. Affiliated with the New Jersey State Horticultural Society. New Brunswick, NJ.

Appropriate Trade Resources

Professional Organizations:

U.S. Dept. of Agriculture
Washington, DC 20250

American Institute of Biological Sciences
1401 Wilson Blvd.
Arlington, VA 22209

American Horticultural Society
National Center for American Horticulture
Mount Vernon, VA 22121

American Association of Nurserymen
230 Southern Bldg.
Washington, DC 20005

American Society for Horticultural Science
701 N. Saint Asaph
Alexandria, VA 22314

Foliage Education and Research Foundation
P.O. Box 4
Apopka, FL 32703

International Plant Propagators' Society
Dept. of Horticulture
Purdue University
W. Lafayette, IN 47907

The American Plant Life Society
2678 Preswik Court
LaJolla, CA 92037

Sources of Additional Information

For career and certification information, contact:

Professional Grounds Management Society
12 Galloway Avenue
Suite 1E
Cockeysville, MD 21030

For career information, contact:

Associated Landscape Contractors of America, Inc.
405 N. Washington Street
Suite 104
Falls Church, VA 22046

Typical Job Titles

Phase I research has conducted an examination of the occupational areas for the environmental horticulture industry and has revealed 11 job titles for which training may be required. The Dictionary of Occupational Titles codes and titles are as follows:

405 HORTICULTURE SPECIALTY OCCUPATIONS

This group includes occupations concerned with propagating and raising products, such as nursery stock, flowers, flowering plants, flower seeds, bulbs, and turf grasses. Also included are occupations concerned with growing require controlled environmental conditions. Occupations concerned with propagating, raising, and transplanting forest trees are classified in Group 451.

405.161-010	BONSAI CULTURIST (agric.) dwarf tree grower.
405.683-014	GROWTH-MEDIA MIXER, MUSHROOM (agric).
405.687-018	FLOWER PICKER (agric.)
405.361-010	PLANT PROPAGATOR (agric.)
405.683-0101	FARMWORKER, BULBS
405.687-014	HORTICULTURAL WORKER (agric) II
405.687-018	TRANSPLANTER, ORCHID (agric.)

DUTY LIST

DUTY TITLE

- A. Performing Administrative Functions
- B. Preparing Soil and Growing Media
- C. Propagating Horticultural Plants
- D. Growing Plants
- E. Performing Equipment/Structure Maintenance Operations
- F. Harvesting Plants
- G. Performing Sales

TASK LIST

DUTY/TASK

DUTY A: Performing Administrative Functions

- A01 Maintain horticultural supply and stock inventory.
- A02 Maintain equipment inventory.
- A03 Prepare supply orders.
- A04 Store stock and supplies
- A05 Plan plant stock production needs.
- A06 Schedule work orders.
- A07 Determine daily assignments.
- A08 Evaluate employee performance.
- A09 Maintain trade organization certification.
- A10 Supervise employees/work crew.
- A11 Estimate labor requirements.

DUTY B: Preparing Soil and Growing Media

- B01 Collect soil samples.
- B02 Test soil sample.
- B03 Pasteurize growing media.
- B04 Sterilize media with chemical soil sterilant.
- B05 Mix growing media.
- B06 Alter pH of growing media.
- B07 Calculate fertilizer requirements.
- B08 Incorporate amendments into growing media.

- B09 Prepare mulch beds for storage of plant materials.
- B10 Spread soil to establish a grade.
- B11 Perform soil erosion control practices.
- B12 Prepare seedbed.
- B13 Aerate sod.
- B14 Top dress lawn.

DUTY C: Cutting and Shaping Components

- C01 Test seeds for germination percentage.
- C02 Sow seeds.
- C03 Stratify seeds.
- C04 Scarify seeds.
- C05 harden off seedlings.
- C06 Transplant seedlings.
- C07 Take cuttings.
- C08 Stick cuttings in medium other than water or mist.
- C09 Apply growth regulator to cuttings.
- C10 Remove cuttings from the propagating area.
- C11 Harden off cuttings.
- C12 Plan plant production schedules.
- C13 Plan plant propagation schedules.
- C14 Propagate plants using grafting techniques.
- C15 Propagate plants using layering techniques.
- C16 Propagate plants using layering techniques.
- C17 Propagate plants by division.

- C18 Set time clocks for mist system.
- C19 Identify spacing for species during propagation.
- C20 Lay sod.

DUTY D: Growing Plants

- D01 Identify plant materials and their cultural requirements.
- D02 Install annual/perennial flowers.
- D03 Irrigate turf.
- D04 Irrigate field grown plants.
- D05 Irrigate container grown plants.
- D06 Prune plants.
- D07 Shear plants.
- D08 Pot plants.
- D09 Transplant trees and shrubs.
- D10 Lay barrier.
- D11 Plant cover crops.
- D12 Apply mulch to a planting bed.
- D13 Label Plants.
- D14 Disbud plants.
- D15 Stake plants.
- D16 Pinch plants.
- D17 Calculate liquid fertilizer concentrations.
- D18 Prepare fertilizer solution.
- D19 Fertilize plants.

- D20 Inspect crops for pests.
- D21 Identify insects for insect control.
- D22 Identify diseases for disease control.
- D23 Identify weeds for weed control.
- D24 Spray plants for pest control.
- D25 Calculate pesticide concentrations.
- D26 Drench plants for pest/environmental control.
- D27 Fumigate plants for pest control.
- D28 Apply granular pesticides.
- D29 Control pests biologically.
- D30 Control pests mechanically.
- D31 Establish plant spacing.
- D32 Regulate growing structure temperature.
- D33 Regulate growing structure humidity.
- D34 Control growing structure light intensity.
- D35 Regulate plants photoperiod.
- D36 Remove dead trees and shrubs.
- D37 Treat plant wounds.
- D38 Mow turf grass.
- D39 Edge turf grass.
- D40 Roll sod.
- D41 Renovate turf.
- D42 Reseed worn spots on turf.
- D43 Apply growth regulator to crops.
- D44 Plant bulbs, corms, tubers, and tuberous roots.

D45 Plant grass stolons, sprigs, and plugs.

D46 Operate Tillers.

D47 Operate Dethatchers.

D48 Operate Weedeaters.

D49 Operate Blowers.

DUTY E: PERFORMING EQUIPMENT/STRUCTURE MAINTENANCE OPERATIONS

E01 Prepare equipment for winter storage.

E02 Construct temporary growing structures.

E03 Construct planters and flats.

E04 Sharpen hand tools and blades.

E05 Perform preventive maintenance of equipment.

E06 Service engine oil and filters.

E07 Perform minor engine tune-up.

E08 Maintain irrigation systems.

E09 Glaze or recover greenhouse structures.

E10 Clean work area.

E11 Dispose of waste materials.

E12 Lubricate equipment.

E13 Clean equipment.

E14 Maintain pesticide application equipment.

E15 Maintain growing structure cooling system.

E16 Maintaining growing structure cooling system.

E17 Order repair parts for equipment.

DUTY F: Harvesting Plants

- F01 Procure plant materials.
- F02 Store plant materials.
- F03 Dig bareroot trees and shrubs.
- F04 Ball trees and shrubs.
- F05 Bundle plant materials.
- F06 Prepare plant materials for shipment.
- F07 Grade plant materials.
- F08 Cut flowers.
- F09 Cut sod.
- F10 Perform post harvest handling of plant material.

DUTY G: Performing Sales

- G01 Plan marketing strategy.
- G02 Present sales information to customer.
- G03 Prepare sales invoice.
- G04 Deliver products to customer.
- G05 Price horticultural products.
- G06 Display retail products.
- G07 Deposit daily cash receipts.
- G08 Complete daily sales reports.
- G09 Operate cash register.
- G10 Estimate cost of customers' order.
- G11 Calculate cost of customers' order.

G12 Develop and draw a basic landscape plan.

G13 Develop floral designs.

G14 Identify floral products.

ENVIRONMENTAL HORTICULTURE

TOOLS AND EQUIPMENT LIST

Tools/Equipment

Aerator
Air compressor
Aprons, pesticide protective
Backpack blower
Backhoe
Bed divider
Bench, greenhouse
Box scraper
Broom
Brush cutter
Brushes
Bulb pans
Burlap
Boots, neoprene
Calculator
Caulking gun
Chipper
Circular saw
Clipboard
Compaction vibrator
Container, paper mache
Controller, irrigation
Cultivator
Cultivator, garden
Controller, watering
Dibble
Digger bar
Disc
Drafting table and stool
Drafting equipment
Drills
Duster
Dust mask
Evaporative cooling system
Eye wash station
Fertilizer injector
Face shield
Fan, exhaust
Fertility analyzer
Flail mower

Tools/Equipment (cont.)

Flats, various
Flower stem stripper
Fogger
Fork, mulch
Fork, pitch
Fork, spading
Front end loader
Galvanized wire
Goggles
Gloves, neoprene
Grafting tool
Grafting strips
Gram scale
Graders, for tractors
Grading rake
Greenhouse bench
Greenhouse washer
Greenhouse water faucets
Greenhouse, plastic
Hammer, claw
Hammer, sledge
Hand carts
Hand tool kit
Heaters
Hoe, garden
Hoe, nurserymans
Hose couplers
Hose, drip irrigation
Hose, low temperature all-weather
Hose, plastic/rubber
Hose reel
Heat tapes
Hot caps
Hygrometer, wet/dry bulb
Heating cables
Hoe, warren
Knife, budding/grafting
Knife, horticultural
Landscape blade
Lawn mower(s), reel and rotary
Leather scabbard
Line strainer
Lister
Loader bucket
Magnifiers
Masonry saw
Mattock
Mat, capillary

Tools/Equipment (cont.)

Mat, propagating
Measuring cups and spoons
Mechanical transplanter
Metal stakes
Meter, humidity
Meter, light
Meter, moisture
Meter, pH
Mist blowers
Misting equipment
Monitor, fertilizer
Monitor, flow
Mulch laying machines
Nails
Narrow tractor
Nozzle, sprayer
Nursery bins
Nozzle, watering
Oil heater
Overseeder
Peg boards
Pipe, plastic
Pipe saddles
Plant dolly
Plant poles
Plant setter
Plant stand
Plant ties
Planter, bulb
Plastic tagging ribbon
Platform trucks
Pliers
Plows
Plug extractor
Post hole digger
Pots, clay
Pots, plastic
Potting machine
Power saw
Pressure regulator
Propagation light
Pruner, anvil
Pruner, hand
Pruner, pole
Pump, high pressure
Pump, irrigation lawn roller
Pump, sprayer

Tools/Equipment (cont.)

Rain gauge
Rake, bow
Rake, leaf
Respirators, dust
Respirators, full face
Roller
Rope
Rotary tillers
Rotating sprinklers
Row covers
Saw, bow
Saw, chain
Saw, tree
Scoop, hand
Seeder, broadcast
Seeder, mechanical
Shade cloth
Shading, liquid
Shading, plastic
Sharpening stones
Shears, cut and hold
Shears, florist
Shears, hedge
Shears, lopping
Shears, ratchet-cut pruning
Shears, ribbon
Shears, thinning
Shovel, round point
Shovel, scoop
Shovel, square point
Shredder
Skid loader with care tree spade
Sod cutter
Sod edger
Sod plugger
Soil mixer
Soil sampler
Soil sterilizers
Soil testing kit
Spade, balling and root
Spade, garden
Sprayers, air blast
Sprayers, hand
Sprayers, high pressure
Sprayers, field
Sprayers, portable

Tools/Equipment (cont.)

Sprayers, stationary
Stapler gun
Table saw
Tape gun
Tape measure
Tape writer label gun
Testing paper, pH
Thermal alarm
Thermometer, all weather
Thermometer, electronic
Thermometer, recording
Thermometer, soil
Thermostats
Tiller
Track crawler/blade
Tractor(s)
Trailer tie-up
Trailer(s)
Trailer(s) tandem axle
Tree grader
Tree spade, mechanical
Treating carts
Trowel, cultivating
Trowel, utility
Truck(s), dump
Truck(s), pickup
Watering can
Weed whip, hand
Wheelbarrow
Wick applicator
Wire stem cutters
Wire mesh
Woven shade lath
Valve, shut-off
Van(s)
Vase, florist

Staff

It is anticipated that the program standards and the program guide developed as a result of this project will not change present staffing levels and certification requirements.

Facilities

The State Technical Committee members, while recognizing the industry movement toward automated performance processes recommended that environmental horticulture programs concentrate on developing basic occupational skills. Therefore, it is anticipated that no significant modification of present facilities will be necessary.

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